Emerging Market Business Cycles: The Cycle is the Trend

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Stylized Facts for Emerging Markets

- **Higher Income Volatility**
  - Emerging market economies on average have a business cycle twice as volatile as that of their developed counterparts.
  - Data Point: EME's have an income volatility of 2.74, which is almost twice the income volatility seen in the case of developed economies, which is 1.34.

Stylized Facts for Emerging Markets

- **Countercyclical Current Account**
  - Emerging markets exhibit strongly counter-cyclical current account, where the trade balance often worsens during economic booms and improves during downturns.
  - Data Point: The average correlation between net exports and output is approximately -0.51 for emerging markets, compared to -0.17 for developed markets.

Stylized Facts for Emerging Markets

- **High Relative Consumption Volatility**
  - Consumption is significantly more volatile than income in emerging markets, in contrast to developed markets where consumption is relatively smooth.
  - Data Point: On average, consumption volatility in emerging markets is 1.45$\times$ the volatility of income, compared to 0.94 in developed markets.

Stylized Facts for Emerging Markets

- **Sudden Stops in Capital Inflows**
  - Emerging markets are prone to sudden stops in capital inflows, leading to sharp adjustments in the trade balance and large economic contractions.
  - Example: During the 1994–95 Mexican Tequila Crisis, the trade balance reversed by 9.6 percentage points of GDP in a single year.

Motivation

This paper challenges traditonal macroeconomic view about business cycles in emerging markets

Traditional View:

- Emerging markets experience the similar type of fluctuation as developed economies but with **higher volatility**.

Alternative View:

- Emerging markets face economic fluctuations that are often caused by **permanent changes in long-term growth trends**.

Research Question

- Can standard Real Business Cycle (RBC) model explain cyclical fluctuations in both emerging and developed economies?
- do emerging markets experience shocks that are largely permanent, requiring a different theoretical framework?

Intuition

- Agents possess information on shock persistence and respond in an optimizing manner.
- Intuition: Permanent income hypothesis
- Combining the PIH and consumption data helps identify the persistence of economic shock .
- Shock to growth rate implies boost to future output and triggers response of consumption to exceed that of income - reduced savings, larger trade deficit
- Conversely, increased savings in case of transitory shocks
- Thus, information on consumption and net exports can infer whether the shock is temporary or permanent

Empirical Strategy

- compare Canada vs Mexico
- estimate the relative variance of long-term shifts in productivity to the total productivity growth

Findings:

- Mexico: 0.96 $\rightarrow$ Most shocks are perceived as permanent.
  Canada: 0.37 $\rightarrow$ Shocks are mostly transitory.
- challenge the conventional real business cycle framework and suggest that emerging market fluctuations require models that account for permanent shifts in productivity growth.

Model Set-up

- The production function is represented as:

$$Y_t = e^{z_t} K_t^{1-\alpha} (\Gamma_t L_t)^{\alpha}, \tag{1}$$

where:

  - $\alpha \in (0, 1)$ represents labor's share of output.
  - z_t and Γ_t are productivity processes with distinct stochastic properties.

- Specifically, z_t follows an AR(1) process:

$$z_t = \rho_z z_{t-1} + \epsilon_t, \tag{2}$$

where ρ_z is the persistence parameter and ϵ_t is a stochastic shock.

Stochastic Properties of Productivity Processes

- The parameter Γ_t represents the cumulative product of "growth" shocks:

$$\Gamma_t = e^{g_t}\Gamma_{t-1} = \prod_{s=0}^{t} e^{g_s}, \tag{1}$$

where

$$g_t = (1-\rho_g)\mu_g + \rho_g g_{t-1} + \epsilon_t^g, \quad |\rho_g| < 1, \quad \epsilon_t^g \sim N(0, \sigma_g^2), \tag{2}$$

and μ_g represents productivity's long-run mean growth rate.

Detrended Variables

- For any variable x, we introduce a detrended counterpart:

$$\hat{x}_t \equiv \frac{x_t}{\Gamma_{t-1}}. \tag{3}$$

Period Utility Function

- The period utility function is Cobb-Douglas:

$$u_t = \frac{[C_t^{\gamma}(1 - L_t)^{1-\gamma}]^{1-\sigma}}{1 - \sigma}, \quad 0 < \gamma < 1. \tag{4}$$

Per-Period Resource Constraint and Debt Dynamics

- The per-period resource constraint is given by:

$$C_t + K_{t+1} = Y_t + (1 - \delta_K) K_t - \frac{\phi}{2} \left(\frac{K_{t+1}}{K_t} - e^{\mu_g} \right)^2 K_t - B_t + q_t B_{t+1} \quad (5)$$

  where δ_K is the depreciation rate, ϕ is the quadratic adjustment cost parameter, and q_t is the price of debt.

- International financial transactions are restricted to one-period, risk-free bonds.

Recursive Formulation of the Agent's Problem

In normalized form, the representative agent's problem can be stated recursively:

$$V\left(\hat{K},\hat{B},z,g\right)=\max_{\{\hat{C},\hat{K}',\hat{B}',L\}}\frac{\left[\hat{C}^{\gamma}(1-L)^{1-\gamma}\right]^{1-\sigma}}{1-\sigma}+\beta e^{g\gamma(1-\sigma)}EV\left(\hat{K}',\hat{B}',z',g\right) \tag{6}$$

subject to

$$\hat{C}+e^{g}\hat{K}'=\hat{Y}+(1-\delta)\hat{K}-\frac{\phi}{2}\left(e^{g}\frac{\hat{K}'}{\hat{K}}-e^{\mu_g}\right)^{2}\hat{K}-\hat{B}+e^{g}q\hat{B}' \tag{7}$$

First Order Conditions

$$u_c(\hat{C}_t, L_t)(g_t + \phi(g_t \frac{\hat{K}_{t+1}}{\hat{K}_t} - \mu_g)g_t) = f(\beta, g_t)E_t \frac{\partial V}{\partial \hat{K}_{t+1}} \tag{8}$$

$$u_c(\hat{C}_t, L_t)g_t q_t + f(\beta, g_t)E_t \frac{\partial V}{\partial \hat{B}_{t+1}} = 0 \tag{9}$$

$$u_L(\hat{C}_t, L_t) + u_c(\hat{C}_t, L_t)\frac{\partial \hat{Y}_t}{\partial L_t} = 0 \tag{10}$$

where $f(\beta, g_t) = \beta g_t^{1-\sigma}$

Hypothesis

Emerging markets have **high volatile** trend growth meaning cycles are driven by long term changes in growth rather that short term fluctuations . More importantly the **Random Walk** component of the solow residual is larger in emerging markets.

Direct Estimation

The authors estimate the relative importance of trend and transitory shocks to productivity in developed and emerging markets.

- From the production function, we get the log of Solow Residual, which is

$$sr_t = z_t + \alpha \ln \Gamma_t. \tag{11}$$

- Rewrite as the sum of a random walk component and transitory component

$$sr_t = \tau_t + s_t \tag{12}$$

Direct Estimation

$$\tau_t = \alpha\mu_g + \tau_{t-1} + \frac{\alpha}{1-\rho_g}\varepsilon_g \tag{13}$$

$$s_t = z_t - \frac{\alpha\rho_g}{1-\rho_g}(g_t - \mu_g) \tag{14}$$

Trend vs Transitory Shocks

- The relative magnitudes of σ_g and σ_z (as well as the respective autocorrelations) capture the importance of trend versus transitory shocks.
- A natural measure of the importance of trend shocks is the variance of $\Delta\tau$ relative to the overall variance of Δsr

$$\frac{\sigma^2_{\Delta\tau}}{\sigma^2_{\Delta sr}} = \frac{\alpha^2\sigma^2_g}{(1-\rho_g)^2\sigma^2_{\Delta sr}}. \tag{15}$$

- τ is unobservable, so we use the conceptual measure advocated in Cochrane (1988)

$$\lim_{K\to\infty} K^{-1}\text{Var}(sr_t - sr_{t-K}) = \sigma^2_{\Delta\tau}. \tag{16}$$

Empirical Concerns

- Short time series (1980-2003)
- Results sensitive to specification and imprecisely estimated
- Recency of the phenomenon of ”emerging market economies” rules out the possibility of extending the series

Empirical Concerns

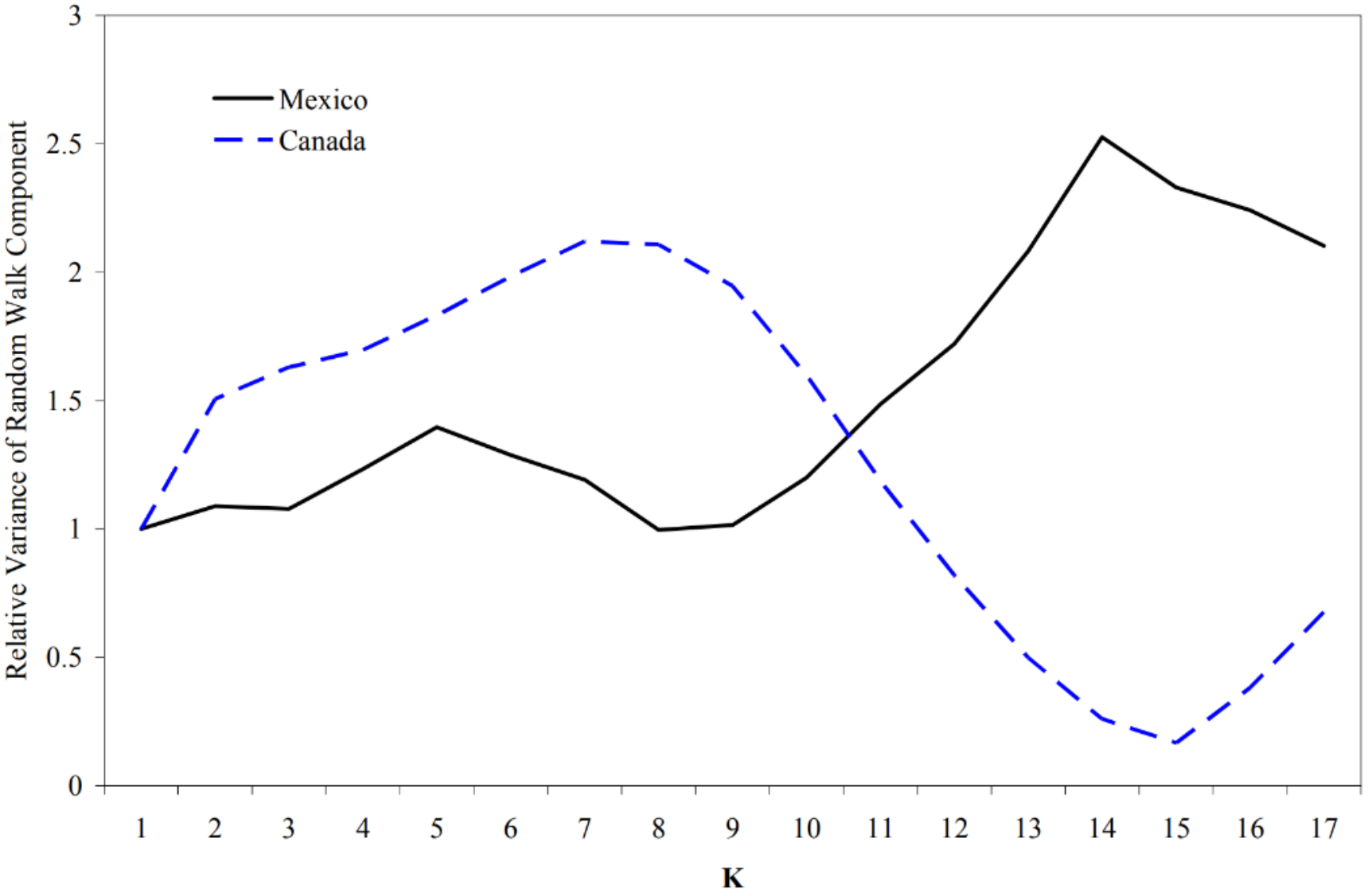

Figure: Random Walk component of Solow residual

Structural Estimation

- Problems with Direct Estimation
- Analyze the behavior of households and firms in response to productivity shocks to say something about the shocks
- We contrast the impulse response following a 1 percent transitory shock with the impulse response to a 1 percent growth shock for the representative emerging economy .
- Important variables: Consumption, Net Exports and Investment

Effect of Shocks: Consumption

If people think an income increase is permanent, they'll feel wealthier and spend more immediately, causing consumption to jump up. If it's temporary, they'll save more, meaning consumption will rise less than income.

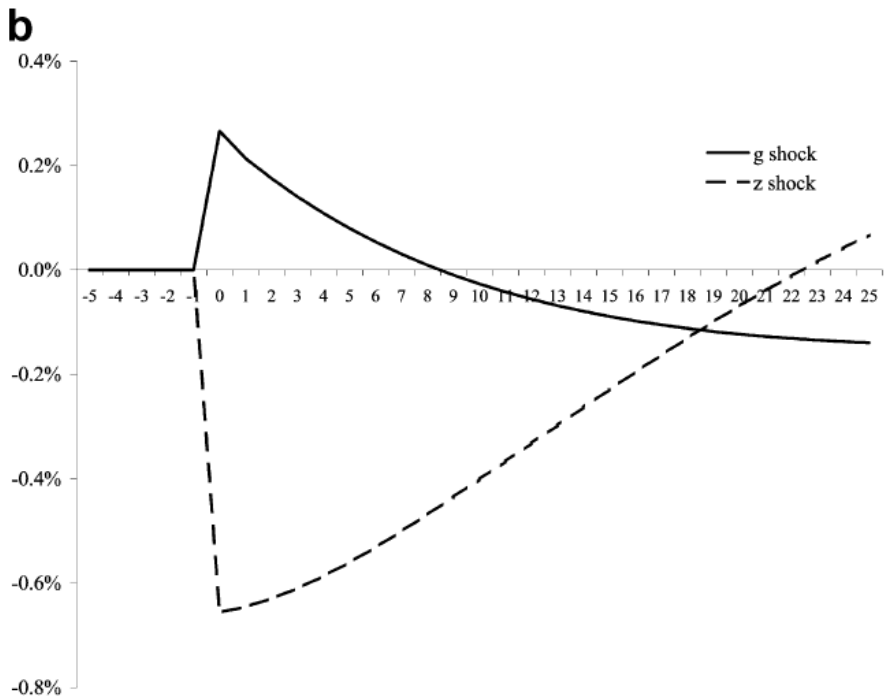

Figure: IRF: Ratio of Consumption to GDP

Effect of Shocks: Net Exports

If there's a trend shock (permanent), consumption might increase so much that people buy more than the country produces, leading to a trade deficit (net exports go down). If it's a temporary shock, consumption and investment don't rise as much, and net exports might stay stable or even improve.

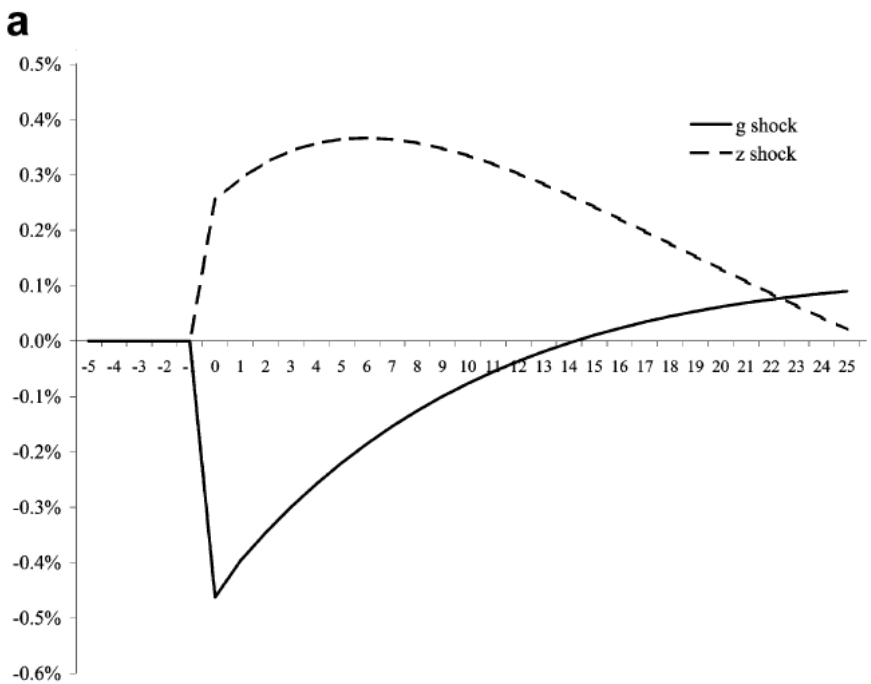

Figure: IRF: Ratio of Net Exports to GDP

Effect of Shocks: Investment

Investment tends to increase for both types of shocks, but it will rise more and for a longer period if the shock is seen as permanent because businesses anticipate higher future productivity and income.

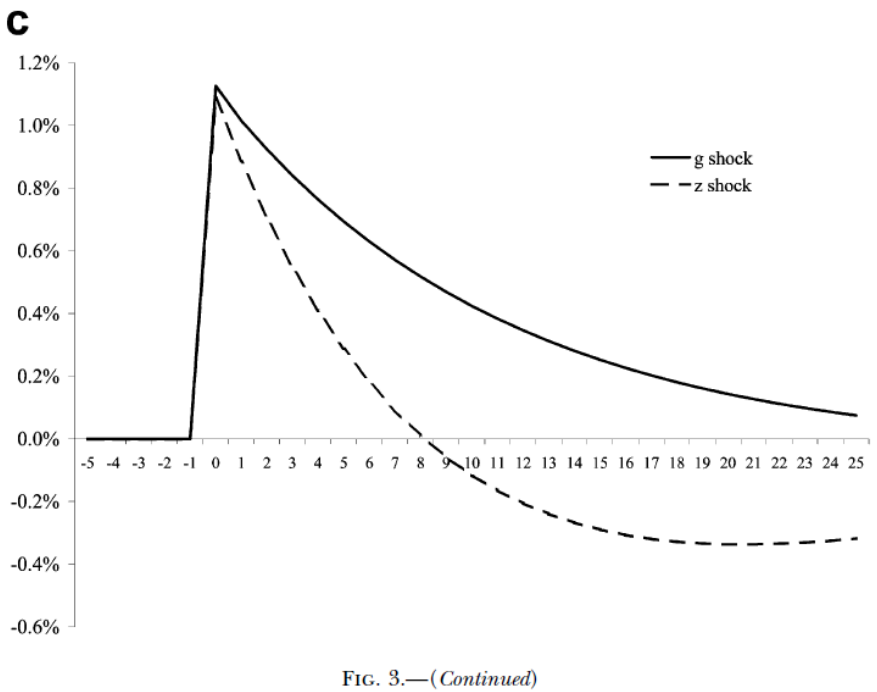

FIG. 3.—(*Continued*)

Figure: IRF: Ratio of Investment to GDP

Which Moments Are Most “Informative”?

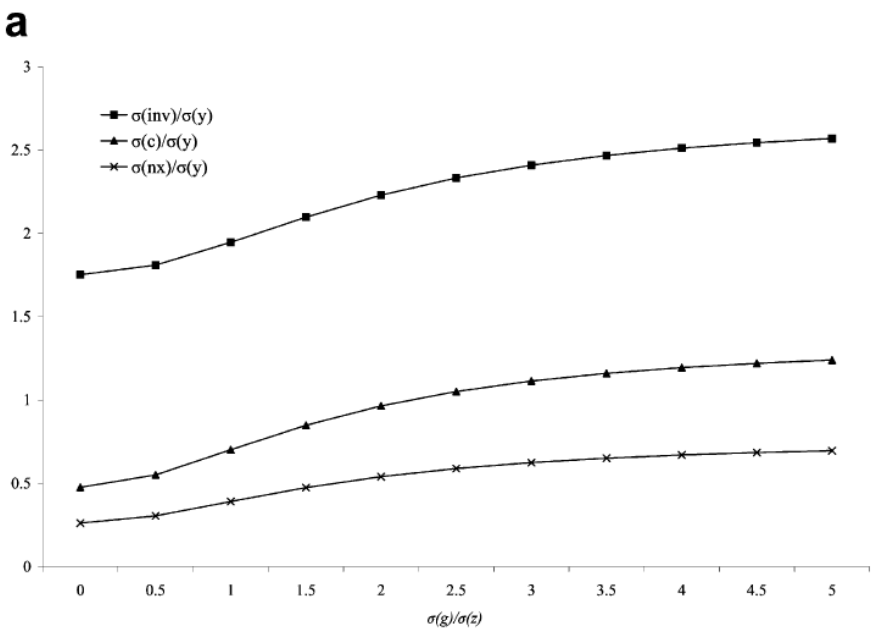

Figure: Volatility

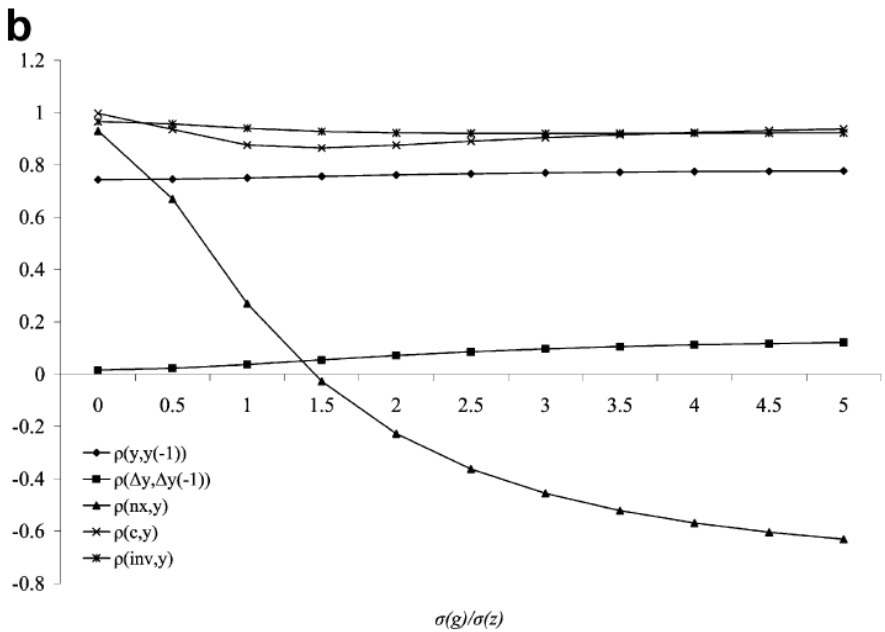

Figure: Correlation

Which Moments Are Most “Informative”?

Aguiar and Gopinath run their model to see which moments are most sensitive to trend shocks. The main ones are:

- Consumption Volatility
- Net Exports Volatility
- Correlation of Net Exports to GDP

Results Part 1: Parameter Estimates

- Estimated the importance of trend (permanent) vs. transitory (temporary) shocks in Mexico (emerging) and Canada (developed).
- **Method**: Used **GMM** to estimate variances of trend (σ_g) and transitory (σ_z) shocks.
- **Key Findings**:
  - **Mexico**: Higher variance of trend shocks, indicating a significant role for changes in economy.
  - **Canada**: Lower variance of trend shocks, with more short-term adjustments around stable growth.
- **Implication**: Trend shocks are central to understanding emerging market cycles, leading to lasting economic shifts.

Results Part 2: Business Cycle Moments

- Testing model's ability to replicate observed business cycle features in Mexico and Canada.
- **Key Moments**:
  - **Relative Consumption Volatility**: Higher in Mexico, reflecting response to permanent shocks.
  - **Net Exports-GDP Correlation**: Strongly negative in Mexico (larger deficits during growth), weakly positive in Canada.
- **Implication**: Emerging markets experience permanent shifts, while developed economies have more stable trends with temporary fluctuations.

Model Fit: Solow Residuals

- The model autocovariances of the estimated Solow residual process is compared to that observed in the data.
- How our model fits into the original data .
- The below graphs depict good fit .

Solow Residuals

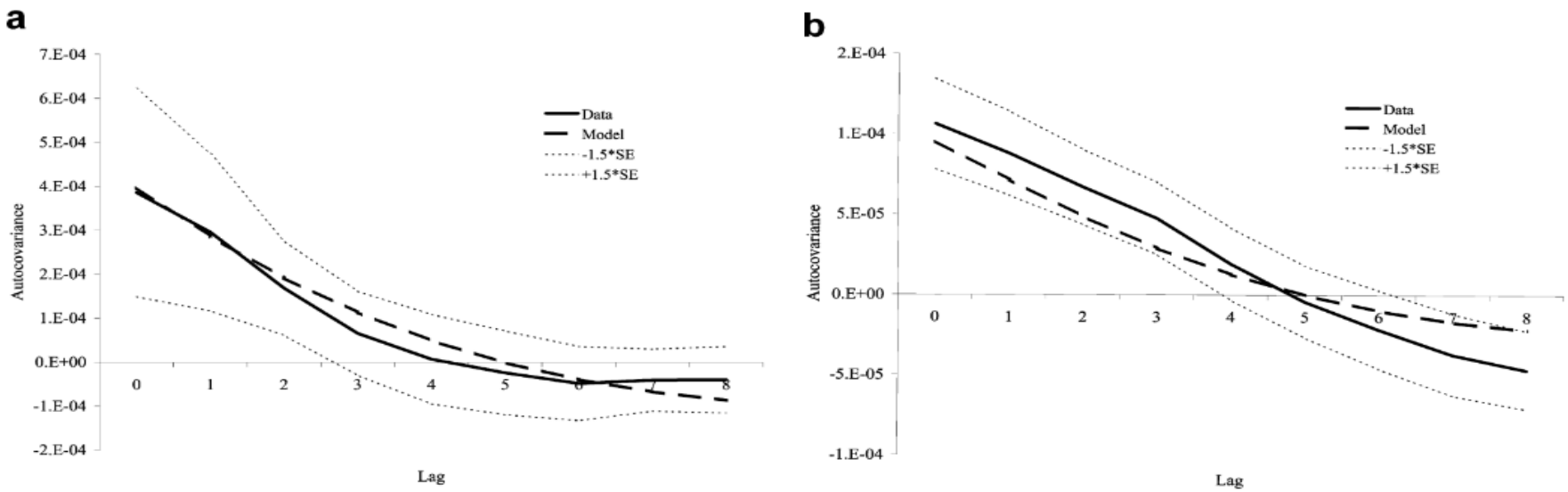

Figure: Autocovariance function of filtered log Solow residuals from the data (solid line) and the model (dashed line) for (a) Mexico and (b) Canada. The dashed lines represent 1.5 standard error bounds.

Meme Time


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Capital Flow Reversals

- Sudden stop: abrupt and large reversal in net capital inflows and the current account
- Example: The Mexican Tequila crisis, when a 9.6 percentage point reversal in the ratio of the trade balance to GDP, from a deficit of 3.8 percent to a surplus of 5.7 percent, was observed between the third quarter of 1994 and the second quarter of 1995.

Model Fit: Sudden Stop

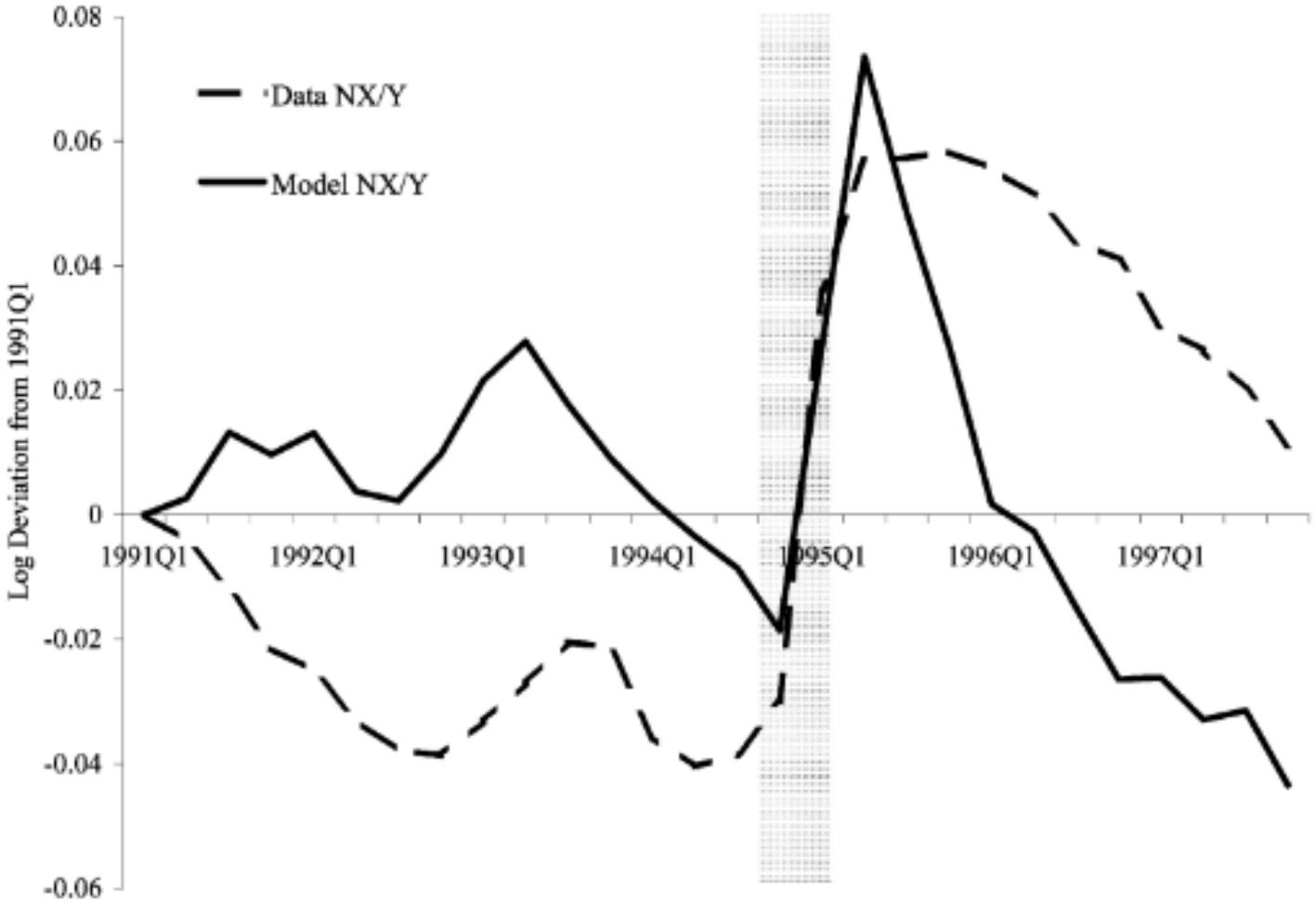

Figure: The dashed line represents the empirical ratio of net exports to GDP in Mexico. The solid line represents the ratio predicted by the model using the observed Solow residuals and the parameters

Conclusion

- Economic activity observed at business cycle frequencies in emerging markets is driven by shocks to a stochastic trend. Conversely, developed economies have relatively stable trends.
- The average random walk component is 0.84 for emerging markets and 0.61 for developed countries.
- In short, the behavior of consumption and net exports over the business cycle implies productivity parameters that are borne out in the data.

Thank You!